

ABSTRACT

A laser parametric generator for surgical applications is disclosed which utilizes short-pulse, mid-infrared radiation. The mid-infrared radiation may be produced by a pump laser source, such as a neodymium-doped laser, which is parametrically down-converted in a suitable nonlinear crystal to the desired mid-infrared range. The short pulses reduce unwanted thermal effects and changes in adjacent tissue to potentially sub-micron-levels. The parametrically converted radiation source preferably produces pulse durations shorter than 25 ns at or near 3.0 μm but preferably close to the water absorption maximum associated with the tissue. The down-conversion to the desired mid-infrared wavelength is preferably produced by a nonlinear crystal such as KTP or its isomorphs. In one embodiment, a non-critically phased-matched crystal is utilized to shift the wavelength from a near-infrared laser source emitting at or around 880 to 900 nm to the desired 2.9-to-3.0 μm wavelength range. A fiber, fiber bundle or another waveguide means utilized to separate the pump laser from the optical parametric oscillation (OPO) cavity is also included as part of the invention.

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